A Brief Description of the DØ Detector in Run II

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The text below provides a description of the main elements of the DØ Detector in Run II of the Tevatron. It is intended as a rough template for insertion into our papers on data analysis. Clearly, different analyses will emphasize different aspects of the hardware, and you should therefore feel free to modify the wording and any technical details. In fact, you are encouraged to modify the text somewhat to avoid issues of plagiarism.

The DØ detector consists of several layered elements. First, is a magnetic central-tracking system, which is comprised of a silicon microstrip tracker (SMT) and a central fiber tracker (CFT), both located within a 2 T superconducting solenoidal magnet [1]. The SMT has $\approx 800,000$ individual strips, with typical pitch of $50-80$ μm, and a design optimized for tracking and vertexing capability at pseudorapidities of $|\eta| < 3$. The system has a six-barrel longitudinal structure, each with a set of four layers arranged axially around the beam pipe, and interspersed with 16 radial disks. The CFT has eight thin coaxial barrels, each supporting two doublets of overlapping scintillating fibers of 0.835 mm diameter, one doublet being parallel to the collision axis, and the other alternating by $\pm 3^\circ$ relative to the axis. Light signals are transferred via clear light fibers to solid-state photon counters (VLPC) that have $\approx 80\%$ quantum efficiency.

Central and forward preshower detectors are located just outside of the superconducting coil (in front of the calorimetry) are constructed of several layers of extruded triangular scintillator strips that are read out using wavelength-shifting fibers and VLPCs. The next layer of detection involves three liquid-argon/uranium calorimeters: a central section (CC) covering $|\eta|$ up to ≈ 1, and two end calorimeters (EC) extending coverage to $|\eta| \approx 4$, all housed in separate cryostats [2]. In addition to the preshower detectors, scintillators between the CC and EC cryostats provide sampling of developing showers at $1.1 < |\eta| < 1.4$.

A muon system resides beyond the calorimetry, and consists of a layer of tracking detectors and scintillation trigger counters before 1.8 T toroids, followed by two more similar layers after the toroids. Tracking at $|\eta| < 1$ relies on 10 cm wide drift tubes [2], while 1 cm mini-drift tubes are used at $1 < |\eta| < 2$.

Luminosity is measured using plastic scintillator arrays located in front of the EC cryostats, covering $2.7 < |\eta| < 4.4$. A forward-proton detector, situated in the Tevatron tunnel on either side of the interaction region, consists of a total of 18 Roman pots used for measuring high-momentum charged-particle trajectories close to the incident beam directions.

The trigger and data acquisition systems are designed to accommodate the high luminosities of Run II. Based on preliminary information from tracking, calorimetry, and muon systems, the output of the first level of the trigger is used to limit the rate for accepted events to $\approx$ 1.5 kHz. At the next trigger stage, with more refined information, the rate is reduced further to ≈ 800 Hz. These first two levels of triggering rely mainly on hardware and firmware. The third and final level of the trigger, with access to all the event information, uses software algorithms and a computing farm, and reduces the output rate to ≈ 50 Hz, which is written to tape.

Special add-on for work based largely on the Muon Spectrometer; this can be inserted at the end of the above paragraph on the Muon System: Coverage for muons is partially compromised in the region of $|\eta| < 1$ *and* $|\phi| < 0.2$ *rad, where the calorimeter is supported mechanically from the ground (see H. T. Diehl, DØ Note 4088, January, 2003).*

[1] DØ Collaboration, V. Abazov *et al.*, "The Upgraded DØ Detector", in preparation for submission to Nucl. Instrum. Methods Phys. Res. A, and T. LeCompte and H.T. Diehl, Ann. Rev. Nucl. Part. Sci. **50**, 71 (2000).

[2] DØ Collaboration, S. Abachi *et al.*, Nucl. Instrum. Methods Phys. Res. A **338**, 185 (1994).